METHOD OF FORMING METALLIC AND CERAMIC THIN FILM STRUCTURES USING METAL HALIDES AND ALKALI METALS

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Cited documents:

US3244482
US5021221
US5453124
US4812301
US5498446

Abstract of **WO9844164**

A new low temperature method for nanostructured metal and ceramic thin film growth by chemical vapor deposition (CVD) involves the use of a low pressure co-flow diffusion flame reactor to react alkali metal vapor and metal halide vapor to deposit metal, alloy and ceramic films. The reaction chemistry is described by the following general equation: (mn) Na + nMXm ------> (M)n + (nm)NaX where Na is sodium, or another alkali metal (e.g., K, Rb, Cs), and MXm is a metal-halide (M is a metal or other element such as Si, B or C; X is a halogen atom, e.g., chlorine, fluorine or the like; and m and n are integers). This reaction chemistry is a viable technique for thin film growth. In one mode, using the precursors of sodium metal vapor, titanium tetrachloride (the limiting reagent), and either argon or nitrogen gases, titanium (Ti), titanium nitride (TiN), titanium dioxide (TiO2), and titanium silicide (TiSi, Ti5Si3, TiSi2, Ti5Si4) thin films have been successfully grown on copper and silicon substrates. Conditions can be adjusted to prevent or minimize gas-phase particle nucleation and growth. Substrate temperatures can also be varied to prevent excessive salt deposition.

POTENTIAL FILMS WHICH CAN BE GROWN WITH THE SODIUM/METAL HALIDE CVD REACTOR VS. CONVENTIONAL CVD

[illegible]	[illegible]	[illegible]	[illegible]
Ti	[illegible]	[illegible]	$TiCl_4$
TiN	[illegible]	[illegible]	$TiCl_4$ and NCl_3
Si	[illegible]	[illegible]	$SiCl_4$ or $SiHCl_3$
Ta	[illegible]	[illegible]	$TaCl_5$
TiB_2	[illegible]	[illegible]	$TiCl_4$+BCl_3
SiC	[illegible]	[illegible]	$SiCl_4$ + CCl_4 or $SiHCl_3$ + CCl_4